

WHAT IS CLAIMED IS:

1. A magnetic head provided with a spin-valve type magnetoresistive element in which a ferromagnetic layer a direction of the magnetization of which is substantially pinned for an external magnetic field and a soft magnetic layer the magnetization of which can be turned according to an external magnetic field are laminated via a non-magnetic intermediate layer and characterized in that the magnetization of the soft magnetic layer is rotated according to the external magnetic field is induced, a relative angle between a direction of the magnetization of the soft magnetic layer and a direction of the magnetization of the ferromagnetic layer varies and magnetoresistance is produced, wherein:
- a single magnetic domain turning ferromagnetic layer is formed on the soft magnetic free layer via a non-magnetic separating layer; and
- the single magnetic domain turning ferromagnetic layer turns the soft magnetic free layer a single magnetic domain so that the soft magnetic free layer has magnetization substantially induced in a direction substantially perpendicular to an external magnetic field because the soft magnetic free layer and the single magnetic domain turning ferromagnetic layer are magnetostatically coupled via the non-magnetic separating layer at the end of track width and a closed magnetic circuit is formed.

2. A magnetic head, comprising:

a spin-valve type magnetoresistive element in which a ferromagnetic pinned layer, a non-magnetic intermediate layer, a soft magnetic free layer, a non-magnetic separating layer and a single magnetic domain turning ferromagnetic layer are laminated in the order and are formed in substantially the same track width corresponding to predetermined magnetic field sensing width, wherein:

- 10 no ferromagnetic or antiferromagnetic coupling is substantially produced between the soft magnetic free layer and the single magnetic domain turning ferromagnetic layer via the non-magnetic separating layer, the magnetization of the single magnetic domain turning ferromagnetic layer and the magnetization of the soft magnetic free layer are magnetostatically coupled at the end of track width and a closed magnetic circuit is formed;
- 15 the soft magnetic free layer is turned a single magnetic domain so that it has magnetization substantially induced in a direction substantially perpendicular to an external magnetic field; and
- 20 a direction of the magnetization of the ferromagnetic induced layer is substantially pinned for an external magnetic field, the magnetization of the soft magnetic free layer is turned according to an external magnetic field, a relative angle between the magnetization of the soft magnetic free layer and the
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magnetization of the ferromagnetic pinned layer varies, magneto resistive change is generated in the magneto resistive element and is detected by a pair of electrodes.

5. A magnetic head according to Claim 1, wherein:

a bias magnetic field is applied to the ferromagnetic pinned layer by laminating the ferromagnetic pinned layer and an antiferromagnetic film or a hard magnetic film and producing exchange coupling and the ferromagnetic pinned layer is polarized in a direction substantially perpendicular to an external magnetic field.

4. A magnetic head according to Claim 1, wherein:

the single magnetic domain turning ferromagnetic layer is formed by a hard magnetic film; and

the hard magnetic film is magnetizing in a direction substantially perpendicular to an external magnetic field.

5. A magnetic head according to Claim 1, wherein:

the single magnetic domain turning ferromagnetic layer is formed by a layered film having ferromagnetic or antiferromagnetic coupling between a hard magnetic film and a soft magnetic buffer layer via a coupling film; and

the magnetization of the hard magnetic film and

the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field.

6. A magnetic head according to Claim 1,

5 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of oxide including Fe, Co, Ni or Mn.

7. A magnetic head according to Claim 1,

10 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of a mixture of oxide and ferromagnetic metal.

8. A magnetic head according to Claim 1,

15 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of a mixture of a semiconductor and ferromagnetic metal.

9. A magnetic head according to Claim 1,

20 wherein:

the non-magnetic separating layer is made of Ta, Hf, Nb, Ti or W or the oxide of any of these.

10. A magnetic head according to Claim 1,

wherein:

25 the non-magnetic separating layer is formed by a deposition of a layer including at least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta, Hf, Nb, Ti and W or a layer including these and a layer made of oxide or a mixture

of at least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta,  
Hf, Nb, Ti and W and oxide.

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